



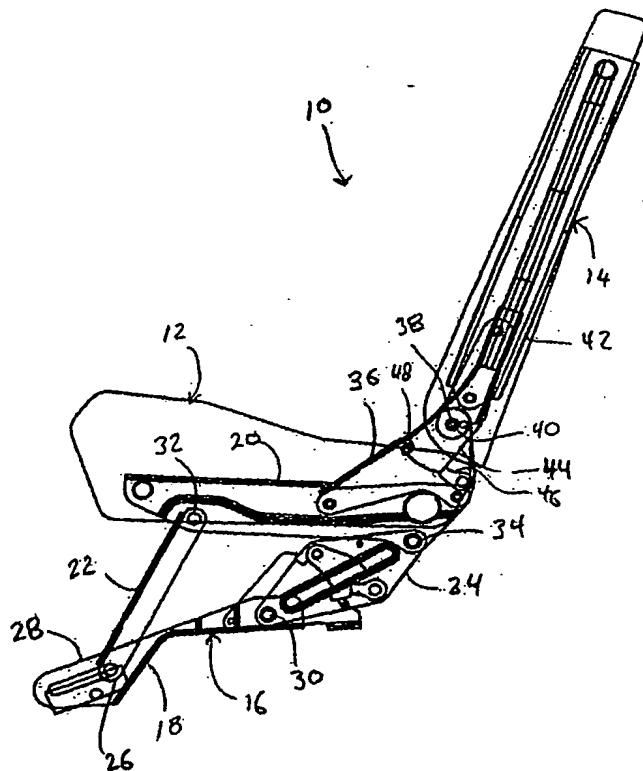
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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## (54) Title: FOLDING VEHICLE SEAT

## (57) Abstract

A seat assembly (10) for a vehicle with a seat cushion (12), a seat back (14) connected to the seat cushion, a front link (22) having an upper end and a lower end; and a rear link (24) having an upper end and a lower end. The upper end of the front link is connected to the seat cushion for pivotal movement about a first axis (32), while the lower end of the front link is connected to the vehicle for pivotal movement about a second axis (26). The front link is further connected to either the seat cushion or the vehicle for sliding movement from a first position to a second position. The upper end of the rear link is connected to the seat cushion for pivotal movement about a third axis (34), while the lower end of the rear link is connected to the vehicle for pivotal movement about a fourth axis (30). The seat assembly may be transitioned from a first use position to a second use position by pivoting the seat cushion about the second axis and the fourth axis. The seat assembly may also be transitioned from the first use position to a stowed position by sliding the front link from the first position to the second position and by rotating the seat cushion about the third axis.



## FOLDING VEHICLE SEAT

### BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to a folding vehicle seat and in particular to a seat which can be folded to a stowed position and also to an upwardly and forwardly raised table position in which the seat back forms a table for use by adjacent seat occupants.

Vehicle manufacturers are continually striving to provide improved convenience features in motor vehicles. The folding seat of the present invention continues in this trend by providing a seat for a second or third seating row in a sport utility vehicle or other vehicle. The seat is foldable to a stowed position in which the seat back forms a load platform for carrying cargo thereon. In addition, the seat can be folded to a table position in which the seat back forms a generally horizontal table surface that can be used by occupants seated to either side of the folding seat. As such, the folding seat of the present invention is primarily intended for use in the center portion of a bench seat or as a center seat in a row of seats. The folding seat of the present invention can, however, be used in other locations in the vehicle if desired.

Briefly, the invention includes a seat assembly for a vehicle with a seat cushion, a seat back connected to the seat cushion, a front link having an upper end and a lower end, and a rear link having an upper end and a lower end. The upper end of the front link is connected to the seat cushion for pivotal movement about a first axis, while the lower end of the front link is connected to the vehicle for pivotal movement about a second axis. The front link is further connected to either the seat cushion or the vehicle for sliding movement from a first position to a second position. The upper end of the rear link is connected to the seat cushion for pivotal movement about a third axis, while the lower end of the rear link is connected to the vehicle for pivotal movement about a fourth axis. The seat assembly may be transitioned from a first use position to a second use position by pivoting the seat cushion about the second axis and the fourth axis. The seat assembly may also be transitioned from the first use position to a stowed position by

coupled to the mounting bracket 28 by a pivot 30. The front link 22 is pivotally connected to the seat cushion frame 20 by a pivot 32 while the upper end of the rear link 24 is coupled to the seat cushion frame 20 by a pivot 34.

A riser 36 is fixed to the seat cushion frame 20 and extends upwardly therefrom.

5 The riser 36 defines a pivot aperture 38 which receives a seat back pivot 40 about which the seat back 14 rotates relative to the seat cushion 12. The seat back 14 includes a seat back frame 42 having a downwardly extending pivot arm 44, somewhat similar in construction to a seat back recliner sector. The pivot arm 44 extends downwardly below the seat back pivot 40 and is fixed against rotation by a locking cam 46 and a stop stud 10 48. The seat back 14 is released from the upright position by rotation of the locking cam 46, freeing the pivot arm 44 to rotate counterclockwise about the axis of the seat back pivot 40. The seat back 14 rotates to a generally horizontal position overlying the seat cushion 12 as shown in FIGS. 2 and 3.

With reference to FIG. 2, the folding seat 10 is shown in the stowed position. The 15 folding seat 10 is moved to the stowed position by rotating the seat back 14 to a lowered position as described above. In addition, the front end of the seat cushion is lowered to enable the seat back 14 to reach a more horizontal orientation. The lower end 26 of the front link 22 has a pivot 50 which is slidable within a slot 52 in the mounting bracket 28. A locking cam (not shown) similar to the locking cam 46, is provided at the slot 52 to 20 hold the pivot 50 at the upper rear end 54 of the slot 52. The pivot 50 is released to slide downward and forward through the slot 52, allowing the seat cushion 12 to rotate about the pivot 34 at the rear link 24. This lowers the front of the seat cushion 12. Folding of the seat to the stowed position is accomplished without rotation of the rear link 24 about the pivot 30.

25 The rear link 24 is held in place about the pivot 30 by a locking mechanism 56. The locking mechanism 56 includes a locking plate 58 which is attached to the mounting bracket 28 by a fastener 60 and is attached to the vehicle floor 16 at the foot 62. A pawl 64 is mounted to the rear link 24 and includes a tooth 66. The tooth 66 is seated into a detent 68 in the locking plate 58, to hold the rear link 24 in a fixed position about the

while the upper end of the front link 22' is slidably connected within the slot 52' of the seat cushion frame 20' at a pivot 50'. The pivot 50' is released to slide upward and forward through the slot 52', allowing the seat cushion 12 to rotate about the pivot 34 at the rear link 24. This lowers the front of the seat cushion 12. Folding of the folding seat

5 10' to the stowed position is accomplished without rotation of the rear link 34 about the pivot 30.

The locking mechanism 56 is releasable to enable the rear link 24 to rotate about the pivot 30 to a tumbled use position of the folding seat 10', as shown in FIG. 6. In the tumbled use position, the upper end of the front link 22' remains at the rear, lower end 10 54' of the slot 52'. The rear link 24 raises the rear end of the seat cushion 20 to enable the seat back 14 to be disposed in a forward direction whereby allowing ingress and egress past the folding seat 10'.

The folding seat 10' also differs from the folding seat 10 because of the modification of the mounting plate 28' to incorporate a tooth 66. This modification 15 allows for the deletion of the locking plate 58, which provides for a cleaner looking folding seat 10' when pivoted into the tumbled use position.

As can be readily understood by a person of ordinary skill in the art, the folding seat 10 of the first preferred embodiment and the folding seat 10' of the second preferred embodiment are, for the most part, interchangeable at the discretion of the manufacturer.

20 It is to be understood that the invention is not limited to the exact construction illustrated and described above, but that various changes may be made if not thereby departing from the scope of the invention as defined in the following claims.

5. The seat assembly of Claim 1 wherein said front link is connected to the vehicle for sliding movement, and wherein said seat back is connected to said seat cushion for pivotal movement from an upright position to a generally horizontal position such that said seat back forms a table surface in the second use position.

6. The seat assembly of Claim 5 wherein said first axis and said third axis are also displaced in an upward direction during the transition of said seat assembly from the first use position to the second use position.

7. The seat assembly of Claim 5 wherein said second axis is displaced in a forward direction relative to the vehicle during the transition of said seat assembly from the first use position to the second use position.

8. The seat assembly of Claim 7 wherein said second axis is also displaced in a downward direction relative to the vehicle during the transition of said seat assembly from the first use position to the second use position.

9. The seat assembly of Claim 1 wherein said front link is connected to said seat cushion for sliding movement, and wherein said seat back moves into a tumbled position in said second use position to allow ingress and egress past said seat assembly.

10. The seat assembly of Claim 9 wherein said first axis is also displaced in a downward direction and said third axis is also displaced in an upward direction during the transition of said seat assembly from the first use position to the second use position.

11. The seat assembly of Claim 9 wherein said first axis is displaced in an upward direction relative to said seat cushion during the transition of said seat assembly from the first use position to the second use position.

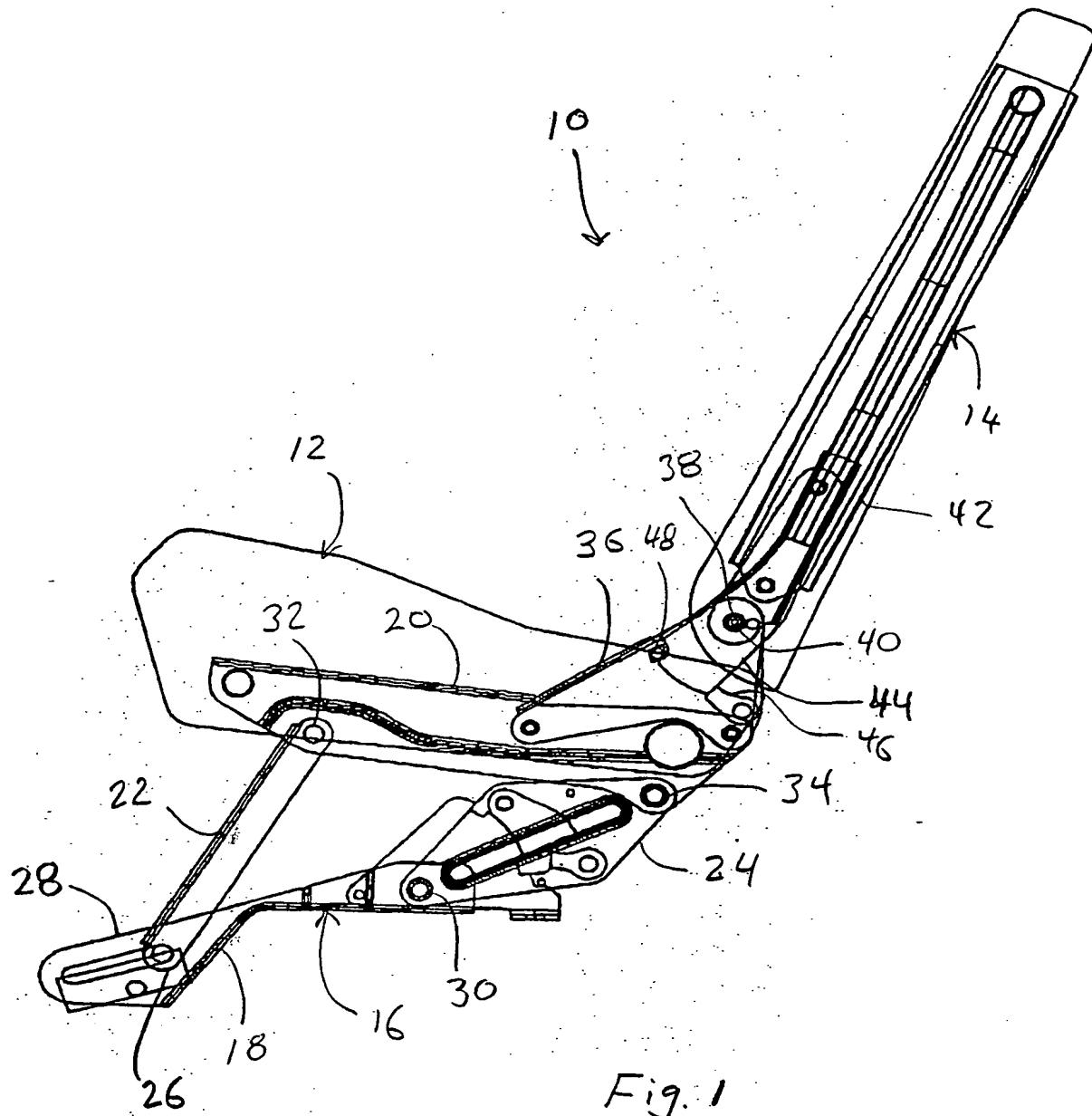


Fig. 1

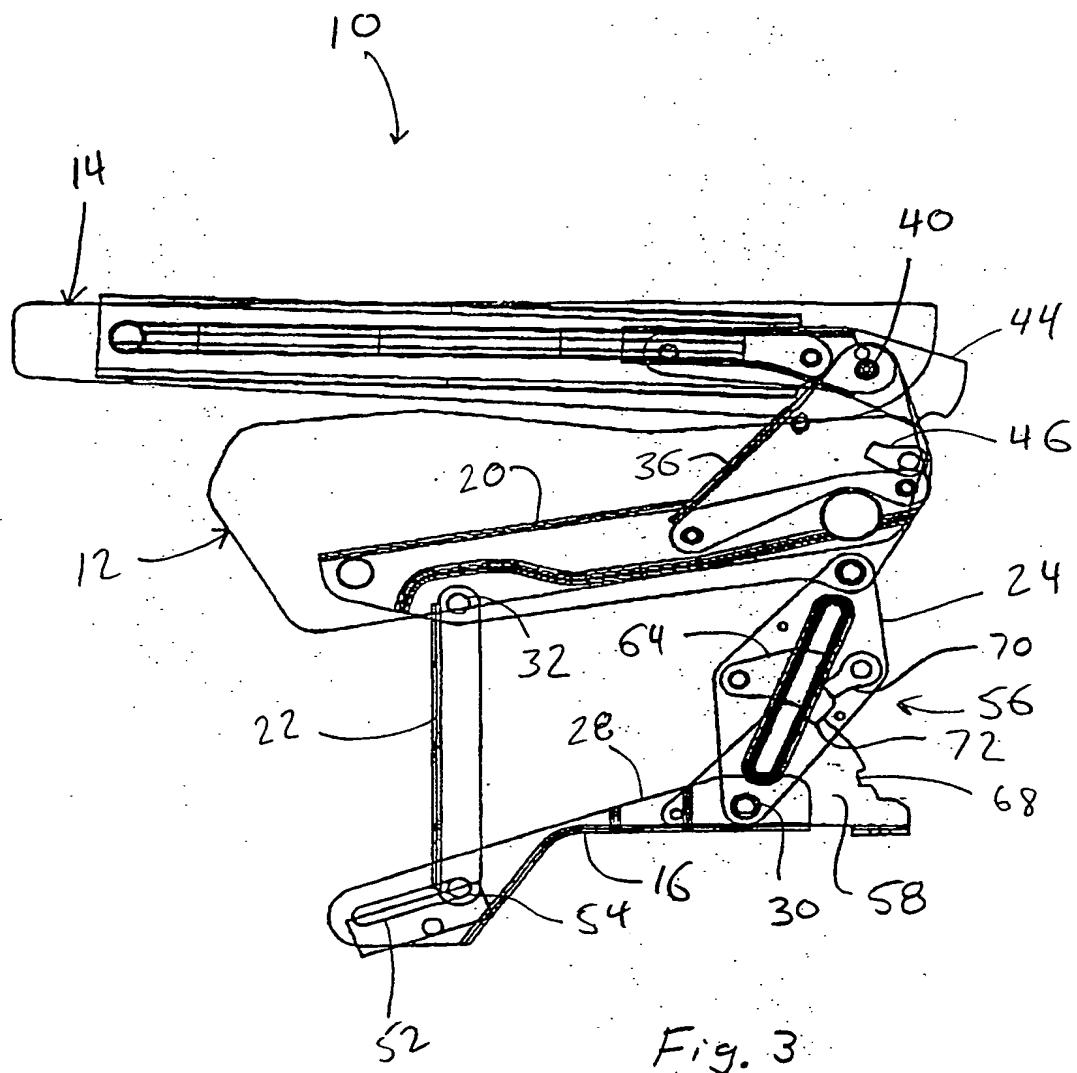
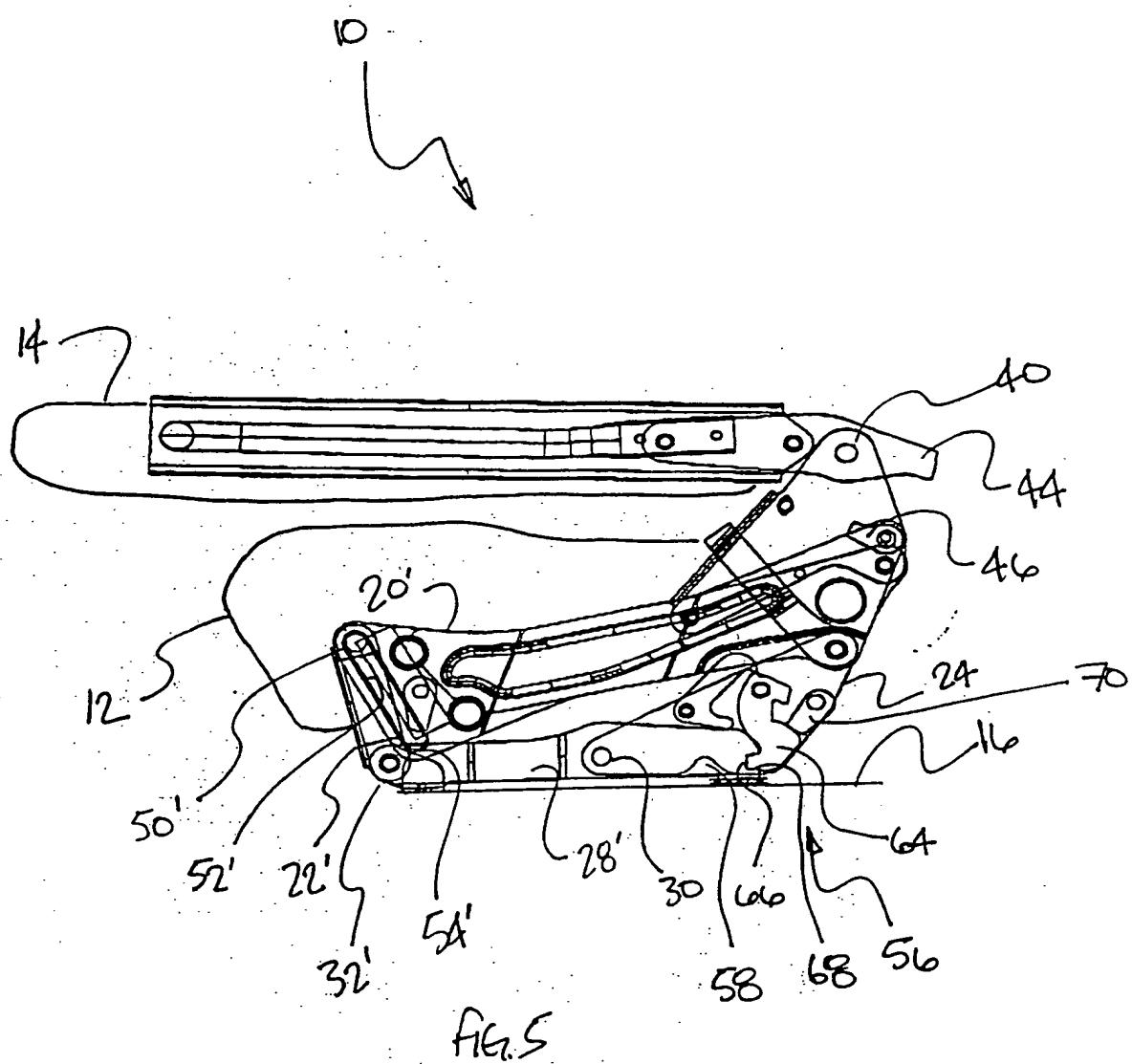


Fig. 3



# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 00/01064

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 B60N2/02 B60N2/04

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B60N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| Y          | EP 0 738 624 A (KEIPER RECARO GMBH CO)<br>23 October 1996 (1996-10-23)             | 1,3,4,13              |
| A          | column 13, line 50 -column 16, line 2;<br>figures 17-21                            | 2,5,9                 |
| Y          | US 5 454 624 A (ANGLADE GERARD ET AL)<br>3 October 1995 (1995-10-03)               | 1,3,4,13              |
|            | column 3, line 16 -column 10, line 19;<br>figures 1-5                              |                       |
| A          | DE 196 07 060 C (KEIPER RECARO GMBH CO)<br>10 April 1997 (1997-04-10)              | 1-5,13                |
|            | abstract; figures 1-6  |                       |
| A          | US 5 397 167 A (FOURREY FRANCOIS ET AL)<br>14 March 1995 (1995-03-14)              |                       |
|            | —/—  |                       |

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

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Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

Int'l. Appl. No.

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| Patent document cited in search report | Publication date | Patent family member(s)  |  | Publication date   |
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| EP 0738624 A                           | 23-10-1996       | DE 19514380 A<br>BR 9504465 A<br>CN 1133795 A<br>DE 59505712 D<br>JP 8282352 A                                 |  | 02-11-1995<br>02-09-1997<br>23-10-1996<br>27-05-1999<br>29-10-1996                             |
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| DE 19607060 C                          | 10-04-1997       | NONE   |  |  |
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| US 3727976 A                           | 17-04-1973       | NONE   |  |  |

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(51) International Patent Classification<sup>7</sup>: **B60N 2/02, 2/04**

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(22) International Filing Date: 15 January 2000 (15.01.2000)

(74) Agents: **STEPHENSON, James, E. et al.**; Harness,  
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MI 48303 (US).

(25) Filing Language: **English**

(81) Designated State (national): **US**.

(26) Publication Language: **English**

(84) Designated States (regional): European patent (AT, BE,  
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NL, PT, SE).

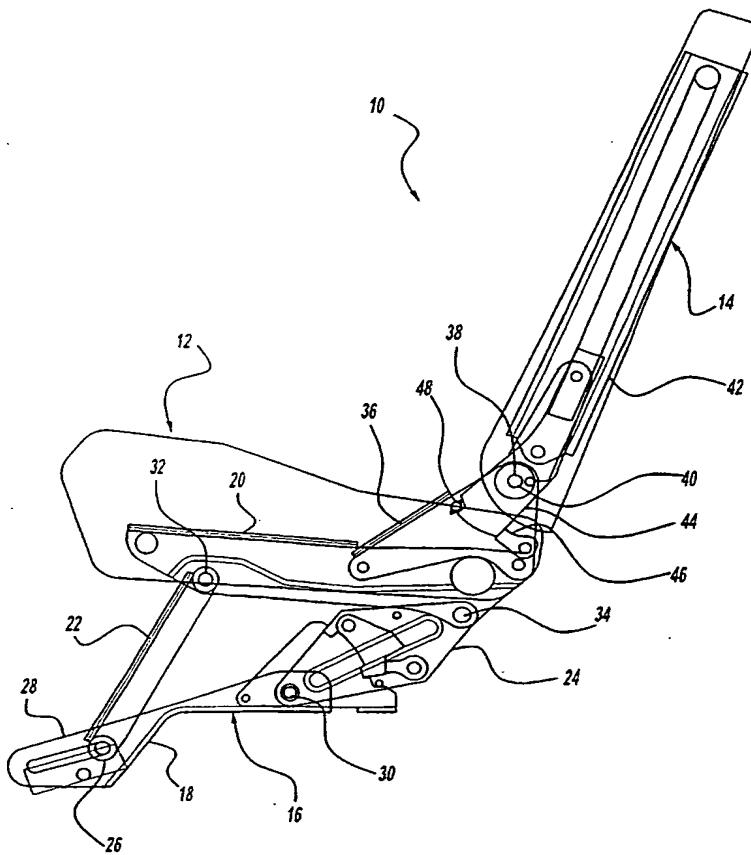
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Published:

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*[Continued on next page]*

(54) Title: FOLDING VEHICLE SEAT



**CORRECTED VERSION**

(19) World Intellectual Property Organization  
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(10) International Publication Number  
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(81) Designated State (national): US.

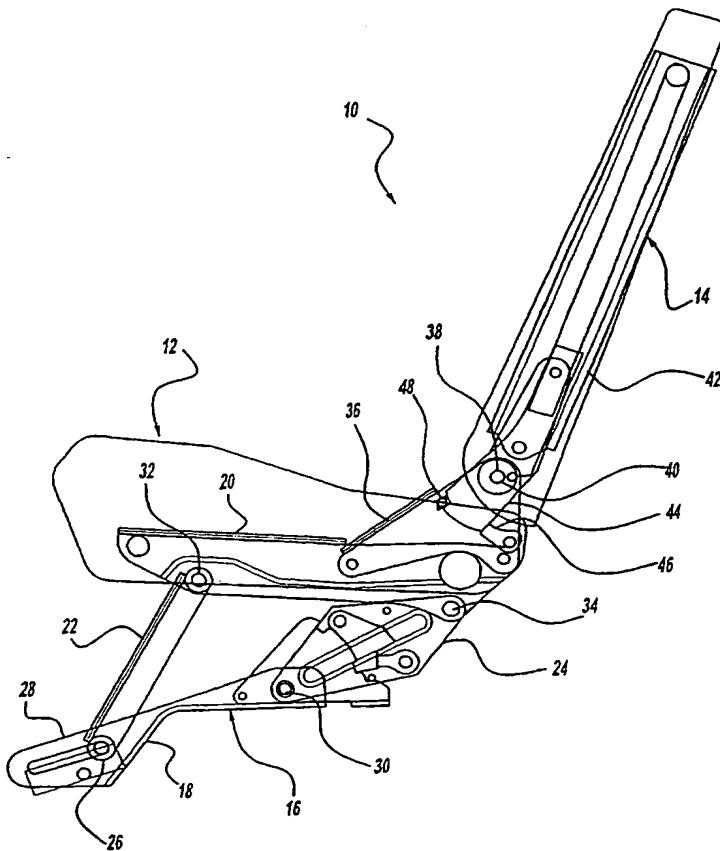
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CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC,  
NL, PT, SE).

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*[Continued on next page]*

(54) Title: SEAT ASSEMBLY



(57) Abstract: A seat assembly (10) for a vehicle with a seat cushion (12), a seat back (14) connected to the seat cushion, a front link (22) having an upper end and a lower end, and a rear link (24) having an upper end and a lower end. The upper end of the front link is connected to the seat cushion for pivotal movement about a first axis (32), while the lower end of the front link is connected to the vehicle for pivotal movement about a second axis (50). The front link is further connected to either the seat cushion or the vehicle for sliding movement from a first position to a second position. The upper end of the rear link is connected to the seat cushion for pivotal movement about a third axis (34), while the lower end of the rear link is connected to the vehicle for pivotal movement about a fourth axis (30). The seat assembly may be transitioned from a first use position to a second use position by pivoting the seat cushion about the second axis and the fourth axis. The seat assembly may also be transitioned from the first use position to a stowed position by sliding the front link from the first position to the second position and by rotating the seat cushion about the third axis.

WO 00/41910 A1

## SEAT ASSEMBLY

### BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to a folding vehicle seat and in particular to a seat  
5 which can be folded to a stowed position and also to an upwardly and forwardly raised  
table position in which the seat back forms a table for use by adjacent seat occupants.

Vehicle manufacturers are continually striving to provide improved convenience  
features in motor vehicles. The folding seat of the present invention continues in this  
trend by providing a seat for a second or third seating row in a sport utility vehicle or  
10 other vehicle. The seat is foldable to a stowed position in which the seat back forms a  
load platform for carrying cargo thereon. In addition, the seat can be folded to a table  
position in which the seat back forms a generally horizontal table surface that can be used  
by occupants seated to either side of the folding seat. As such, the folding seat of the  
present invention is primarily intended for use in the center portion of a bench seat or as  
15 a center seat in a row of seats. The folding seat of the present invention can, however,  
be used in other locations in the vehicle if desired.

Briefly, the invention includes a seat assembly for a vehicle with a seat cushion,  
a seat back connected to the seat cushion, a front link having an upper end and a lower  
end, and a rear link having an upper end and a lower end. The upper end of the front link  
20 is connected to the seat cushion for pivotal movement about a first axis, while the lower  
end of the front link is connected to the vehicle for pivotal movement about a second  
axis. The front link is further connected to either the seat cushion or the vehicle for  
sliding movement from a first position to a second position. The upper end of the rear link  
25 is connected to the seat cushion for pivotal movement about a third axis, while the  
lower end of the rear link is connected to the vehicle for pivotal movement about a fourth  
axis. The seat assembly may be transitioned from a first use position to a second use  
position by pivoting the seat cushion about the second axis and the fourth axis. The seat  
assembly may also be transitioned from the first use position to a stowed position by

coupled to the mounting bracket 28 by a pivot 30. The front link 22 is pivotally connected to the seat cushion frame 20 by a pivot 32 while the upper end of the rear link 24 is coupled to the seat cushion frame 20 by a pivot 34.

A riser 36 is fixed to the seat cushion frame 20 and extends upwardly therefrom.

5 The riser 36 defines a pivot aperture 38 which receives a seat back pivot 40 about which the seat back 14 rotates relative to the seat cushion 12. The seat back 14 includes a seat back frame 42 having a downwardly extending pivot arm 44, somewhat similar in construction to a seat back recliner sector. The pivot arm 44 extends downwardly below the seat back pivot 40 and is fixed against rotation by a locking cam 46 and a stop stud 10 48. The seat back 14 is released from the upright position by rotation of the locking cam 46, freeing the pivot arm 44 to rotate counterclockwise about the axis of the seat back pivot 40. The seat back 14 rotates to a generally horizontal position overlying the seat cushion 12 as shown in FIGS. 2 and 3.

With reference to FIG. 2, the folding seat 10 is shown in the stowed position. The 15 folding seat 10 is moved to the stowed position by rotating the seat back 14 to a lowered position as described above. In addition, the front end of the seat cushion is lowered to enable the seat back 14 to reach a more horizontal orientation. The lower end 26 of the front link 22 has a pivot 50 which is slidable within a slot 52 in the mounting bracket 28. A locking cam (not shown) similar to the locking cam 46, is provided at the slot 52 to 20 hold the pivot 50 at the upper rear end 54 of the slot 52. The pivot 50 is released to slide downward and foreword through the slot 52, allowing the seat cushion 12 to rotate about the pivot 34 at the rear link 24. This lowers the front of the seat cushion 12. Folding of the seat to the stowed position is accomplished without rotation of the rear link 24 about the pivot 30.

25 The rear link 24 is held in place about the pivot 30 by a locking mechanism 56. The locking mechanism 56 includes a locking plate 58 which is attached to the mounting bracket 28 by a fastener 60 and is attached to the vehicle floor 16 at the foot 62. A pawl 64 is mounted to the rear link 24 and includes a tooth 66. The tooth 66 is seated into a detent 68 in the locking plate 58, to hold the rear link 24 in a fixed position about the

while the upper end of the front link 22' is slidably connected within the slot 52' of the seat cushion frame 20' at a pivot 50'. The pivot 50' is released to slide upward and forward through the slot 52', allowing the seat cushion 12 to rotate about the pivot 34 at the rear link 24. This lowers the front of the seat cushion 12. Folding of the folding seat 5 10' to the stowed position is accomplished without rotation of the rear link 34 about the pivot 30.

The locking mechanism 56 is releasable to enable the rear link 24 to rotate about the pivot 30 to a tumbled use position of the folding seat 10', as shown in FIG. 6. In the tumbled use position, the upper end of the front link 22' remains at the rear, lower end 10 54' of the slot 52'. The rear link 24 raises the rear end of the seat cushion 20 to enable the seat back 14 to be disposed in a forward direction whereby allowing ingress and egress past the folding seat 10'.

The folding seat 10' also differs from the folding seat 10 because of the modification of the mounting plate 28' to incorporate a tooth 66. This modification 15 allows for the deletion of the locking plate 58, which provides for a cleaner looking folding seat 10' when pivoted into the tumbled use position.

As can be readily understood by a person of ordinary skill in the art, the folding seat 10 of the first preferred embodiment and the folding seat 10' of the second preferred embodiment are, for the most part, interchangeable at the discretion of the manufacturer.

20 It is to be understood that the invention is not limited to the exact construction illustrated and described above, but that various changes may be made if not thereby departing from the scope of the invention as defined in the following claims.

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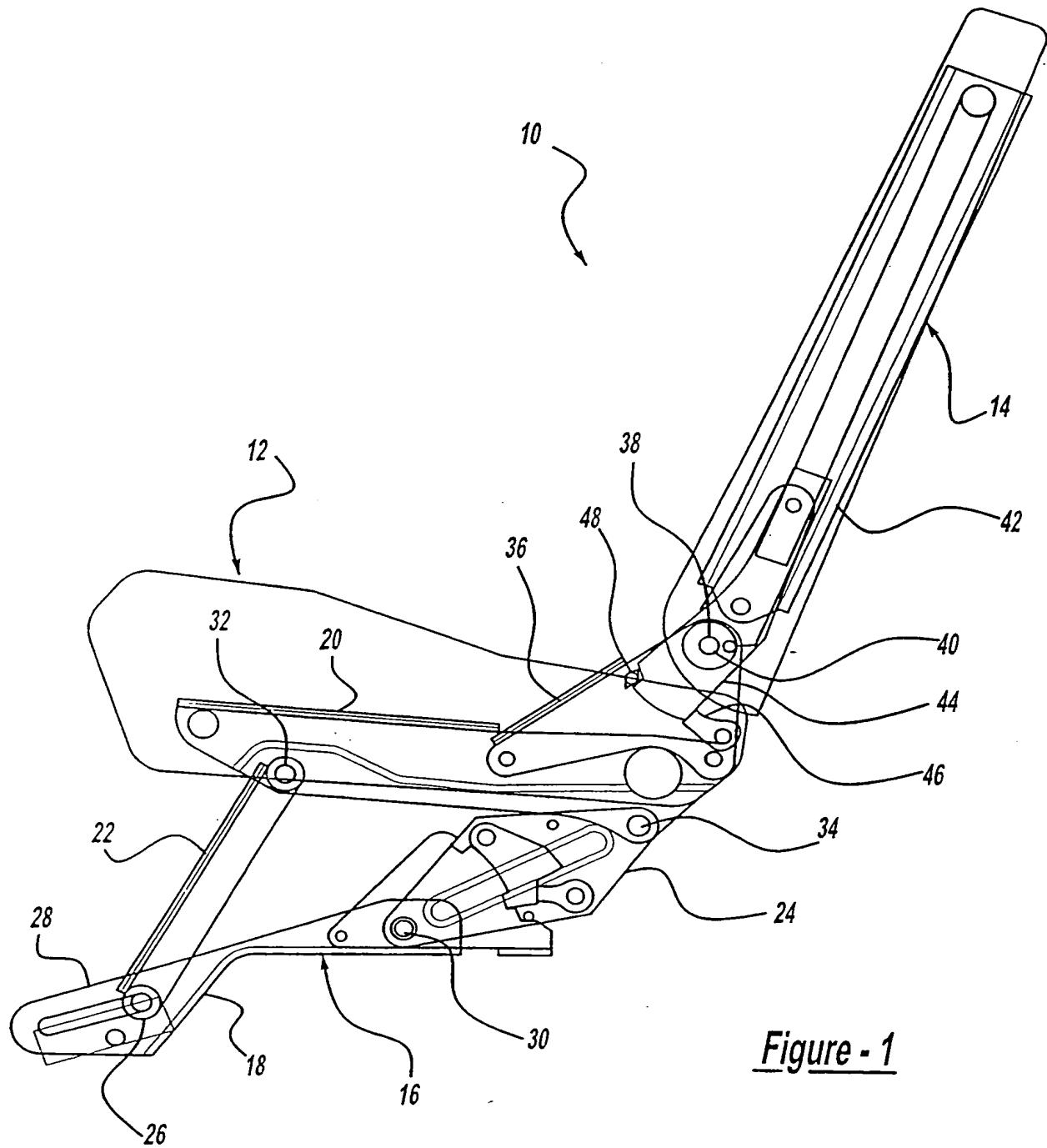
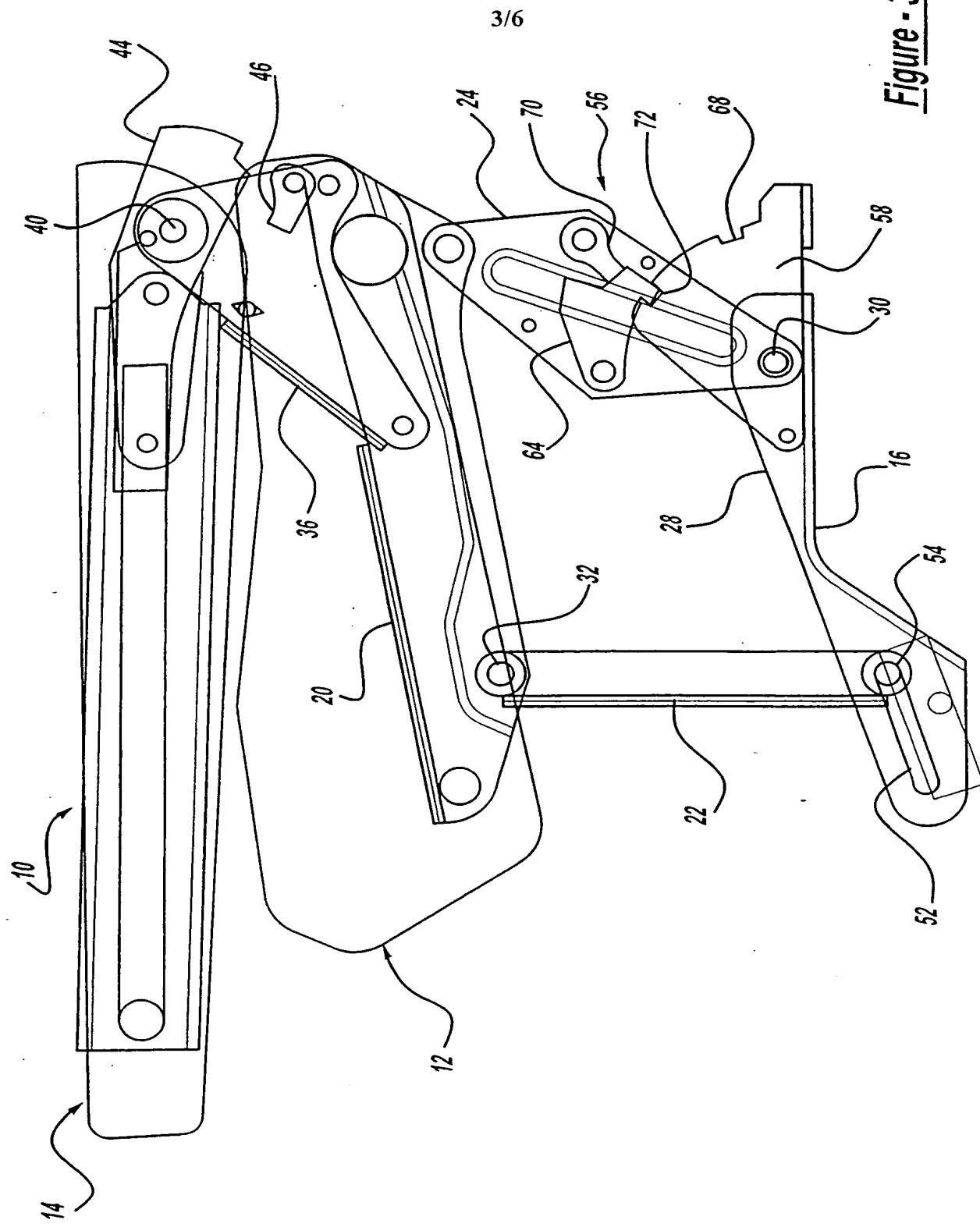


Figure - 3

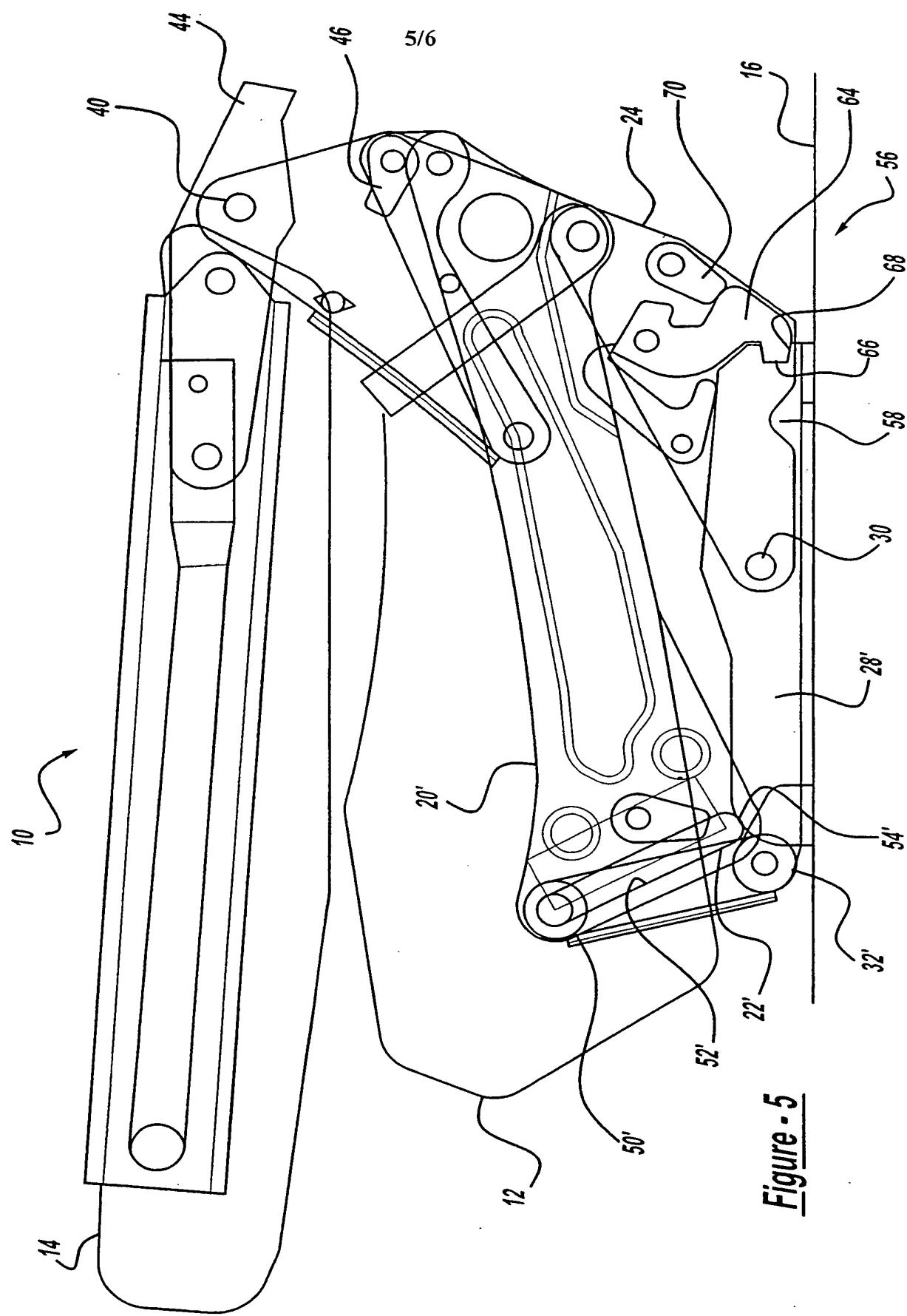


Figure 5

# INTERNATIONAL SEARCH REPORT

|                 |                    |
|-----------------|--------------------|
| Inten           | nal Application No |
| PCT/US 00/01064 |                    |

| <b>A. CLASSIFICATION OF SUBJECT MATTER</b><br>IPC 7 B60N2/02 B60N2/04   |  |                       |  |                       |   |  |          |   |   |       |   |  |          |  |   |  |   |   |        |  |                       |  |   |   |  |  |   |  |  |   |  |
|---|--|-----------------------|--|-----------------------|---|--|----------|---|---|-------|---|--|----------|--|---|--|---|---|--------|--|-----------------------|--|---|---|--|--|---|--|--|---|--|
| According to International Patent Classification (IPC) or to both national classification and IPC   |  |                       |  |                       |   |  |          |   |   |       |   |  |          |  |   |  |   |   |        |  |                       |  |   |   |  |  |   |  |  |   |  |
| <b>B. FIELDS SEARCHED</b><br>Minimum documentation searched (classification system followed by classification symbols)<br>IPC 7 B60N  |  |                       |  |                       |   |  |          |   |   |       |   |  |          |  |   |  |   |   |        |  |                       |  |   |   |  |  |   |  |  |   |  |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched   |  |                       |  |                       |   |  |          |   |   |       |   |  |          |  |   |  |   |   |        |  |                       |  |   |   |  |  |   |  |  |   |  |
| Electronic data base consulted during the international search (name of data base and, where practical, search terms used)  |  |                       |  |                       |   |  |          |   |   |       |   |  |          |  |   |  |   |   |        |  |                       |  |   |   |  |  |   |  |  |   |  |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category</th> <th style="width: 80%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 10%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>Y</td> <td>EP 0 738 624 A (KEIPER RECARO GMBH CO)<br/>23 October 1996 (1996-10-23)</td> <td>1,3,4,13</td> </tr> <tr> <td>A</td> <td>column 13, line 50 -column 16, line 2;<br/>figures 17-21</td> <td>2,5,9</td> </tr> <tr> <td>Y</td> <td>US 5 454 624 A (ANGLADE GERARD ET AL)<br/>3 October 1995 (1995-10-03)</td> <td>1,3,4,13</td> </tr> <tr> <td></td> <td>column 3, line 16 -column 10, line 19;<br/>figures 1-5</td> <td></td> </tr> <tr> <td>A</td> <td>DE 196 07 060 C (KEIPER RECARO GMBH CO)<br/>10 April 1997 (1997-04-10)</td> <td>1-5,13</td> </tr> <tr> <td></td> <td>abstract; figures 1-6</td> <td></td> </tr> <tr> <td>A</td> <td>US 5 397 167 A (FOURREY FRANCOIS ET AL)<br/>14 March 1995 (1995-03-14)</td> <td></td> </tr> <tr> <td></td> <td>—</td> <td></td> </tr> <tr> <td></td> <td>—</td> <td></td> </tr> </tbody> </table> |  | Category              | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. | Y | EP 0 738 624 A (KEIPER RECARO GMBH CO)<br>23 October 1996 (1996-10-23) | 1,3,4,13 | A | column 13, line 50 -column 16, line 2;<br>figures 17-21 | 2,5,9 | Y | US 5 454 624 A (ANGLADE GERARD ET AL)<br>3 October 1995 (1995-10-03) | 1,3,4,13 |  | column 3, line 16 -column 10, line 19;<br>figures 1-5 |  | A | DE 196 07 060 C (KEIPER RECARO GMBH CO)<br>10 April 1997 (1997-04-10) | 1-5,13 |  | abstract; figures 1-6 |  | A | US 5 397 167 A (FOURREY FRANCOIS ET AL)<br>14 March 1995 (1995-03-14) |  |  | — |  |  | — |  |
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| A   | column 13, line 50 -column 16, line 2;<br>figures 17-21                            | 2,5,9                 |  |                       |   |  |          |   |   |       |   |  |          |  |   |  |   |   |        |  |                       |  |   |   |  |  |   |  |  |   |  |
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|   | column 3, line 16 -column 10, line 19;<br>figures 1-5                              |                       |  |                       |   |  |          |   |   |       |   |  |          |  |   |  |   |   |        |  |                       |  |   |   |  |  |   |  |  |   |  |
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